

EXHIBIT D

**IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF NEW YORK**

RUSSELL DOVER, JONATHAN STONE,)
CODY RANK, AND SUZETTE PERRY, on)
behalf of themselves and all others similarly) Case No. 1:12-cv-05567-MKB-
situated,) MDG
)
Plaintiffs,) Hon. Raymond J. Dearie
v.)
)
BRITISH AIRWAYS, PLC (UK))
)
Defendant.)
)

**Supplemental Expert Report of
Jonathan I. Arnold, Ph.D.**

September 14, 2015

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I. INTRODUCTION

A. ASSIGNMENT

1. My name is Jonathan I. Arnold. I previously submitted two expert reports in this proceeding, on May 4, 2015¹ and July 15, 2015.² I gave a deposition in this matter on August 20, 2015. My background and qualifications, including my curriculum vitae and a list of my prior testimony are contained in the May 4, 2015 report.

2. I have been asked by counsel to respond to: (i) certain claims made by Marc B. Sherman in his August 28, 2015 Report³ and (ii) opinions that he offered for the first time during his deposition on August 21, 2015.⁴ I have also been asked to respond to claims made by Dr. Andrew Hildreth in his August 28, 2015 Report⁵ and certain claims made by Daniel M. Kasper in his September 4, 2015 Report.⁶ To the extent that I do not address one or more opinions expressed by Mr. Sherman, Dr. Hildreth, or Mr. Kasper, it does not mean I agree

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1. Expert Report of Jonathan I. Arnold, Ph.D., May 4, 2015 (hereafter “Arnold Report”).
 2. Expert Reply Report of Jonathan I. Arnold, Ph.D., July 15, 2015 (hereafter “Arnold Reply Report”).
 3. Corrected Rebuttal Report of Marc B. Sherman, Supplemented, August 28, 2015 (hereafter “Sherman Supplemental Report”).
 4. Deposition of Marc Sherman, August 21, 2015 (hereafter “Sherman Dep.”).
 5. Rebuttal Report of Andrew K.G. Hildreth, Ph.D, August 28, 2015 (hereafter “Hildreth Report”).
 6. Corrected Industry Expert Report of Daniel M. Kasper, Supplemented, September 4, 2015 (hereafter “Kasper Supplemental Report”).

with them. A list of the materials which I have relied upon in reaching my conclusions is attached to this report as Appendix 1.

B. SUMMARY OF CONCLUSIONS.

3. In my initial reports, I concluded based on my analysis, skills, knowledge, experience, education, and training that:

- As a matter of economics, the YQ Charges cannot be considered fuel surcharges. In order to be considered fuel surcharges, the YQ Charges must reflect changes in either the price of fuel or BA's cost of fuel. The YQ Charges do not reflect either one. Rather, my analysis of YQ Charges leads me to conclude that they were simply an element of the total price that BA charged its customers.
- The claims of Mr. Sherman and Mr. Kasper that the YQ Charges are reasonably related to fuel prices or costs are incorrect. In fact, their opinions corroborate one of my core findings—that the YQ Charges are simply an element of price.
- Neither Mr. Sherman nor Mr. Kasper offers a meaningful attempt to justify the use of 2003-2004 fuel surcharges as a baseline for the YQ Charges.
- Contrary to Mr. Sherman's claims, the proposed class is homogeneous, and liability and damages can be demonstrated on a class-wide basis.

- I have proposed a number of alternative damages approaches. One of the approaches posits that, instead of relying on fuel surcharges, BA could have used its base fares to capture any increases in fuel costs it experienced. The remaining approaches suggest “but-for” fuel surcharges which are explicitly tied to either BA’s incremental fuel costs or to fuel prices. None of Mr. Sherman’s claims undermine this opinion.⁷

4. The opinions expressed by Mr. Sherman, Dr. Hildreth, and Mr. Kasper in their recent reports do not make me change any of my conclusions. Moreover, I have reached the following conclusions about their new work:

- Mr. Sherman relies on statistical work performed by Dr. Hildreth to support his conclusion that the YQ Charge is reasonably related to fuel prices, and hence can be considered a fuel surcharge.
 - While Dr. Hildreth concluded that “from a statistical perspective”⁸ the YQ Charge is related to fuel prices, he applied statistical tools to the data incorrectly and unreliably. His analyses suffer from a well-known flaw that renders them meaningless as a matter of statistics or economics.

7. I note that, as I have previously opined, if the finder of fact finds that any of BA’s or Mr. Sherman’s arguments regarding their proposed class exclusions are valid, it is a straightforward exercise to incorporate these into my damages calculations. See Arnold Reply Report, ¶45.

8. Hildreth Report, ¶39.

- Once Dr. Hildreth's mistake is corrected, it is clear that the data exhibit neither an economically relevant nor statistically significant relationship between BA's YQ Charges and fuel prices.
- Even if Dr. Hildreth's statistical analyses had been performed in an appropriate fashion, neither they nor any of Mr. Sherman's observations undermine my economic analysis that indicates that the YQ Charge is not reasonably related to fuel prices or costs.
- Mr. Sherman now speculates that BA would have changed its Avios policy had it decided to eliminate the YQ Charge. He offers no support for his opinion other than stating that BA executives told him that they would have done this when he apparently suggested it to them. Mr. Sherman's speculation is inconsistent with, and largely contradicted by, the testimony and documents in the record (both standing alone and in combination with relevant economic principles and analysis).
 - The record indicates: (1) that BA did not consider changing its Avios policy when it considered eliminating its YQ Charge; (2) that BA did not change its Avios policy in connection with any of the multiple changes it made to its YQ Charge.
 - Mr. Sherman's speculation that BA could unilaterally change the value of its frequent flier miles, Avios, ignores the fact that BA competes with other airlines' frequent flyer programs.

Avios are redeemable on flights of BA's partner airlines and, thus, are a close substitute to BA's partner airlines' miles. In addition, since Avios are used for purchasing a wide array of products and services, the value of Avios depends on many factors unrelated to air transportation.

- Industry practice suggests that many airlines with divergent fuel surcharge strategies have pursued strategies with their frequent flyer programs that are similar. This also indicates that Mr. Sherman's speculation is without merit.
- Mr. Sherman's claim that the Y Fare is a commonly used fare is incorrect as an empirical matter. His claim, moreover, that it is a relevant benchmark for the value of reward tickets would be incorrect as a matter of economics even if the Y Fare were common.
- Mr. Kasper makes several claims in his August report that are incorrect or economically irrelevant.

5. The remainder of this report is organized as follows:

- Section II demonstrates that Dr. Hildreth's statistical analysis is flawed and unreliable: Mr. Sherman cannot use this analysis to demonstrate that the YQ Charge is reasonably related to fuel prices. It further shows that Dr. Hildreth's results disappear when a well-accepted method is used to correct Dr. Hildreth's methodological error.

- **Section III** shows that the information in the record and industry practice contradict Mr. Sherman's hypothesis that BA would have changed its Avios policy had it decided to eliminate the YQ Charge.
- **Section IV** shows that Mr. Sherman's claim that the Y fare is common is baseless and irrelevant.
- **Section V** demonstrates that several of Mr. Kasper's claims are incorrect or economically irrelevant.
- **Section VI** concludes.

II. DR. HILDRETH'S STATISTICAL ANALYSIS IS FLAWED AND DOES NOT DEMONSTRATE THAT YQ CHARGES AND FUEL PRICES ARE REASONABLY RELATED.

A. CORRELATION AND REGRESSION ANALYSES, WHILE OFTEN USEFUL ECONOMIC TOOLS, CANNOT BE APPLIED BLINDLY TO ANY DATA.

6. In my initial report, I discussed a variety of economic analyses that indicate that BA's YQ Charge is not reasonably related to fuel prices or fuel costs. These include: the fact that the YQ Charge was simply an element of the all-in price BA charges its customers⁹; the fact that fuel prices often changed without a similar directional change in the YQ Charge¹⁰; the fact that the YQ Charges increased much more rapidly than fuel prices¹¹; the fact that the YQ Charges were often larger than base fares¹²; and the fact that YQ Charges varied by direction of

9. Arnold Report, ¶¶21-32; Arnold Reply Report, ¶¶14-17.

10. Arnold Report, ¶¶34-35.

11. Arnold Report, ¶36.

12. Arnold Report, ¶¶37-39.

travel on the same city pair route.¹³ I note that Mr. Sherman agreed with some of my conclusions, notably the fact that BA's YQ Charge was affected by competition, and thus, was simply an element of the all-in price.¹⁴

7. In response to my many different economic analyses, Mr. Sherman relies on statistical work performed by Dr. Hildreth to support his conclusion that "BA's fuel surcharge is reasonably related to and, in fact, exhibits a high degree of correlation to, the fuel price."¹⁵ Dr. Hildreth's conclusion that "from a statistical perspective ... BA's fuel surcharge was reasonably related to the weighted spot price of jet fuel"¹⁶ is based on an incorrect application of statistical and econometric tools to the data; in fact, the data do not show "a high degree of correlation" between the YQ Charge and the fuel price when Dr. Hildreth's error is corrected.

8. Moreover, while correlation and regression analyses are often used by economists, it is important to recognize that purely statistical analyses cannot provide definitive answers to most economic questions. Indeed, contrary to the statement made by Dr. Hildreth that his regression analysis shows "the degree to which the variation in BA's fuel surcharge is determined by the variation in the

13. Arnold Report, ¶¶40-41.

14. For example, Mr. Sherman testified during his deposition that "[t]he way that I mean it in paragraph 30 is that as part of the fuel surcharge setting process or as part of charging the fuel surcharge, BA considered its competitive position that it was being put in and would make adjustments in order to meet what they thought was the competitive place they needed to be." Sherman Dep., p. 129.

15. Sherman Supplemental Report, ¶112.

16. Hildreth Report, ¶39.

price (or cost) of jet fuel kerosene”,¹⁷ regression analysis does not demonstrate causation. This is explained, for example, in the very first chapter of one of the textbooks Dr. Hildreth cited:

In other words, does regression imply causation? Not necessarily... it is up to economic theory ... to establish the cause-and-effect relationship, if any, between the dependent and explanatory variables.¹⁸

The same text explains that “[c]orrelation does not necessarily imply causality.”¹⁹ This in part is why I performed many economic analyses of the relationship between fuel prices and BA’s YQ Charge, rather than looking to statistical tests of correlation.

9. However, an important additional reason I relied upon economic rather than purely statistical analyses is the fact that the data in question have a characteristic that renders Dr. Hildreth’s analysis inappropriate and wholly unreliable. Although both correlation and regression analyses are widely used statistical techniques that can be used in conjunction with underlying economic theory, both can lead to “spurious” results—that is, results that are meaningless as a matter of statistics—if applied to data that have certain statistical properties.

17. Hildreth Report, ¶40.

18. Gujarati, D.N. and Porter, D.C., Essentials of Econometrics, 4th ed., McGraw-Hill, 2010, p. 8. Also see Peter Kennedy, A Guide to Econometrics, 5th Edition (2003), p. 74.

19. Gujarati, D.N. and Porter, D.C., Essentials of Econometrics, 4th ed., McGraw-Hill, 2010, p. 446. See also https://en.wikipedia.org/wiki/Correlation_does_not_imply_causation.

10. As explained in detail below, mechanical application of many standard statistical tests to a “non-stationary” data series, including regression and correlation analyses, produce statistically invalid results. Put differently, regression and correlation analyses are valid only if the underlying data possess particular properties. One such property is “stationarity.” For example, research by a Nobel Prize winning econometrician indicated that even completely randomly generated non-stationary data series would appear to be correlated 75 percent of the time.²⁰

11. Colloquially, a non-stationary data series is one that tends to “wander” up or down instead of fluctuating around some average value.²¹ A common example of non-stationary data is the so-called “random walk” that is often used to describe stock prices.²²

12. The fact that many standard statistical analyses are invalid when the underlying data are non-stationary is well accepted by statisticians and

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- 20. This seminal paper stressed the dangers of running standard statistical models on non-stationary data, and illustrated the problem by showing that one can detect a relationship between two independent data series in “approximately three quarters of all occasions.” See Granger and Newbold, Spurious Regressions In Econometrics, Journal of Econometrics (1974) 111-120.
 - 21. More formally, a data series is “non-stationarity” if its statistical properties, such as mean, change from one observation to the next.
 - 22. “Financial time series such as the S&P 500 stock index, the Dow-Jones index, and foreign exchange rates are often said to follow a “random walk” in the sense that knowing the values of these variables today will not enable us to predict what these values will be tomorrow.” Gujarati, D.N. and Porter, D.C., Essentials of Econometrics, 4th ed., McGraw-Hill, 2010, p. 384-385.

economists.²³ Indeed, a subsection called “THE PHENOMENON OF SPURIOUS REGRESSION: NONSTATIONARY TIME SERIES” of the textbook Dr. Hildreth cited clearly states that:

Regression models involving time series data sometimes give results that are spurious, or of dubious value, in the sense that superficially the results look good but on further investigation they look suspect.²⁴

13. One highly regarded econometrics textbook explains this well-known concept in more detail:

[I]t was thought that the validity of traditional econometric analyses was not adversely affected by nonstationarity of the variables being analyzed. It came as a bit of a shock to econometricians, then, when studies appeared claiming that most macroeconomic data are nonstationary, because they are characterized by a “random walk”... It was a further shock when additional studies showed that statistics such as the t and DW statistics, and measures such as R², did not retain their traditional characteristics in the presence of nonstationary data: running regressions with such data could produce spurious results (i.e., results which erroneously indicate, through misleading values of R², DW, and t statistics, that a meaningful relationship among the regression variables exists). One consequence of these discoveries is that it has become very important when working with economic time series data to test for nonstationarity before proceeding with estimation. This has forever changed the character of all empirical work ...²⁵

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- 23. Indeed, I would be surprised if a Fellow of the Royal Statistical Society was unfamiliar with this literature.
 - 24. Gujarati, D.N. and Porter, D.C., Essentials of Econometrics, 4th ed., McGraw-Hill, 2010, p. 380.
 - 25. Peter Kennedy, A Guide to Econometrics, 5th Edition (2003), p. 325; See also Jeffrey M. Wooldridge, Introductory Econometrics: A Modern Approach, 2nd Edition (2003), p. 845.; Chris Brooks, Introductory Econometrics for Finance, (2002), p. 367-368; Damodar N.

14. As Dr. Hildreth correctly pointed out, the R^2 statistic obtained from a regression involving two variables is closely related to the coefficient of correlation.²⁶ Therefore, the spurious regression problem applies equally to both R^2 and correlation coefficients reported by Dr. Hildreth.

15. While Dr. Hildreth claims that his correlation and regression analyses show “as matter of statistics” a close relationship between the YQ Charges and fuel prices, his conclusions are entirely meaningless and his analysis wholly unreliable because he applies them mechanically to data that, as explained below, are non-stationary. This is a fundamental error in the fields of statistics and economics.

B. THE DATA USED BY DR. HILDRETH ARE NON-STATIONARY INDICATING THAT HE HAS NO BASIS FOR FINDING A CLOSE CORRELATION BETWEEN THE YQ CHARGES AND FUEL PRICES OR COSTS.

16. Dr. Hildreth presents the results of three closely related types of analyses— R^2 statistics from univariate regressions, correlation coefficients, and Spearman rank correlation coefficients—performed on three different data samples.²⁷ This generates 78 statistics that lead Dr. Hildreth to conclude that “there is a high degree of correlation (over 70 percent) between BA’s fuel

Gujarati, Basic Econometrics, 3rd Edition (1995), p. 709.; Damodar N. Gujarati, Basic Econometrics, 3rd Edition (1995), p. 724.

26. Hildreth Report, ¶21.
27. The three sets are: (1) data that was referenced in the Amended Complaint; (2) data that I used to generate Figure 1 of my Reply Report; (3) and data used by Mr. Sherman to generate Chart 4 of his report.

surcharge and the price (or cost) of jet fuel kerosene.”²⁸ However, had Dr. Hildreth tested whether these data are stationary, he would have recognized that he could not reach the conclusion he expressed.

17. The fact that the data at issue in this case (known as “time series data”) are often non-stationary is one of the reasons I did not perform any correlation or regression analyses in my first two reports. I have, moreover, performed standard statistical tests to determine whether data series used by Dr. Hildreth’s series are non-stationary. Among other tests, I performed a test known as Augmented Dickey-Fuller test.²⁹ Figure 1 presents the results of this test for the data that Dr. Hildreth received from Mr. Sherman (the results on the other data series are included in Appendix 2).³⁰ The results demonstrate that these data are non-stationary.³¹ For that reason, the correlation and regression analyses performed by Dr. Hildreth are invalid.

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28. Hildreth Report, ¶40. I note in passing that none of Dr. Hildreth’s analyses have examined the relationship between fuel costs and the YQ except insofar as he assumes that fuel prices are equivalent to fuel costs.
 29. A more basic (non-augmented) version of this test is described in Gujarati, D.N. and Porter, D.C., Essentials of Econometrics, 4th ed., McGraw-Hill, 2010, p. 382-383. For the description of augmented version see Peter Kennedy, A Guide to Econometrics, 5th Edition (2003), p. 350. In essence, this test is designed to test for the presence of “unit-root” in the data series. A common example of non-stationary data described above, a random walk, has the “unit root” property.
 30. In particular, this data was used to generate Mr. Sherman’s “Chart 4.”
 31. Other tests of non-stationarity, the Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin tests, confirm the finding that the data used by Dr. Hildreth are non-stationary. The results of these tests are included in Appendix 3.

Figure 1

**Augmented Dickey-Fuller Test for Sherman's Data
(Chart 4/Figure 2 Arnold Rebuttal Report)**

	Test Statistic (Tau)	Statistical Significance		Test Result
		(p-Value)		
Weighted Spot Price of Jet Fuel	-1.455	0.557	Non-Stationary / Cannot Correlate	
Long Haul < 9 Hrs World Traveller	-0.227	0.933	Non-Stationary / Cannot Correlate	
Long Haul < 9 Hrs World Traveller Plus	-0.218	0.934	Non-Stationary / Cannot Correlate	
Long haul < 9 Hrs Club World & First	0.313	0.979	Non-Stationary / Cannot Correlate	
Long Haul > 9 Hrs World Traveller	-0.579	0.873	Non-Stationary / Cannot Correlate	
Long Haul > 9 Hrs World Traveller Plus	-0.439	0.900	Non-Stationary / Cannot Correlate	
Long Haul > 9 Hrs Club World & First	-0.025	0.955	Non-Stationary / Cannot Correlate	
Short Haul Euro Traveller	-1.767	0.397	Non-Stationary / Cannot Correlate	
Short Haul Club Europe	-1.396	0.586	Non-Stationary / Cannot Correlate	

Notes: The null hypothesis is that the series are non-stationary (have unit root). p-Values above the typically used 0.05 (5% level) indicate that the null hypothesis that the data are non-stationary cannot be rejected. The single mean, zero lags test results are reported.

Source: Sherman_00002554.

18. Even if these data were stationary, a purely statistical analysis is no substitute for the types of economic analyses I presented in my two prior reports, which demonstrate that there is not a reasonable relationship between the YQ Charges and fuel prices or costs. This is so in part because, while statistical analysis is a valuable discipline for determining whether there *may* be a causal relationship worthy of further investigation, it cannot be used to prove that such a causal relationship exists.

C. WHEN A COMMONLY USED TRANSFORMATION OF NON-STATIONARY DATA IS EMPLOYED, DR. HILDRETH'S STATISTICAL RESULTS DISAPPEAR.

19. When economists and statisticians are faced with a non-stationary dataset, they can use well-accepted techniques to transform that non-stationary data into stationary data and then perform statistical tests on the stationary data.

One transformation used to make data series stationary is to analyze the “first differences” of the data series—that is, to analyze the period-to-period changes in the data series.³² I have performed this transformation and confirmed that the “first differences” data are, in fact, stationary.³³ The regression and correlation tests performed by Dr. Hildreth are thus appropriate to use with “first differences” data.

20. Performing Dr. Hildreth’s regression and correlation analyses reliably (i.e., on the stationary data) demonstrates that it is not possible to use his methodology to reach the conclusion that there is a statistically significant—much less a close economic—relationship between changes in jet fuel prices and changes in YQ Charges. See Figure 2 (the results on the other data series are included in Appendix 5). Taking long-haul under 9 hours economy YQ (“Long Haul < 9 Hrs World Traveller”) as an example, Figure 2 shows that the correlation of changes of in this YQ and changes in fuel costs is 0.013 (1.3 percent), R^2 is 0, and Spearman correlation coefficient is 0.009 (0.9 percent). The correlations between changes in other YQ measures and changes in fuel costs are similarly low. This finding, while not dispositive of the issues in this case, corroborates my economic analysis that there is not a reasonable relationship between the YQ Charges and fuel prices or costs.

32. See Peter Kennedy, A Guide to Econometrics, 5th Edition (2003), p. 319.

33. In other words, the statistical hypothesis of non-stationarity is strongly rejected on the transformed data. The results of these tests are contained in Appendix 4.

Figure 2

**R-Squared and Correlation Coefficients for Sherman's Data
(Chart4/Figure 2 Arnold Rebuttal Report)
First Differences**

	R-Squared	Correlation Coefficient	Spearman Correlation Coefficient
Long Haul < 9 Hrs World Traveller	0.000	0.013	0.009
Long Haul < 9 Hrs World Traveller Plus	0.000	-0.002	0.003
Long haul < 9 Hrs Club World & First	0.000	-0.003	-0.003
Long Haul > 9 Hrs World Traveller	0.000	0.000	0.004
Long Haul > 9 Hrs World Traveller Plus	0.000	-0.012	-0.002
Long Haul > 9 Hrs Club World & First	0.000	-0.014	-0.009
Short Haul Euro Traveller	0.001	-0.025	-0.033
Short Haul Club Europe	0.001	-0.033	-0.039

Source: Sherman_00002554

III. MR. SHERMAN'S YQ-AVIOS SUBSTITUTION HYPOTHESIS CONTRADICTS THE FACTUAL RECORD AND MARKET CONDUCT.

A. BA DID NOT INCREASE THE AVIOS COST OF REWARD TICKETS IN THE ABSENCE OF YQ CHARGES.

21. Mr. Sherman now speculates that, in a scenario without YQ Charges, BA would have increased the number of Avios required for class members to receive an award ticket. I disagree. Specifically, I believe that the record in this case, combined with information on industry practices and conduct, rules out Mr. Sherman's view that "[i]n the 'but for' world where BA did not charge cash for its increased cost of fuel as Mr. Arnold proposes, I understand that BA would have sought to compensate for that lost contribution to its increased fuel bills by increasing the number of Avios required for a redemption ticket (or imposing a similar charge, which would accomplish the same economic result)."³⁴

34. Sherman Supplemental Report, ¶119.

22. Mr. Sherman bases his new “understanding” on recent conversations with BA executives.³⁵ Mr. Sherman offers absolutely no analysis that would support his “understanding” other than vaguely alluding to a 15-minute conversation.³⁶ Moreover, his claim ignores both (i) the fact that my damages analyses contained many alternatives in which BA could have charged an actual fuel surcharges and, more significantly, (ii) BA’s actual behavior during the class period. This behavior indicates that BA itself did not attempt to increase the Avios cost of reward tickets in the absence of the YQ Charge, completely undermining Mr. Sherman’s claims.

23. As discussed in my initial report, in 2008 BA considered [REDACTED]

[REDACTED]
[REDACTED]. However, the [REDACTED] cited in my May 4, 2015 report show that BA did not consider [REDACTED]

[REDACTED].³⁷

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- 35. Sherman Supplemental Report, ¶119 and footnote 151. Mr. Sherman does not provide the information that would make it possible to evaluate his “methodology.”
 - 36. “My conversation with him was with either three or all four people on the phone at the same time. It wasn’t an individual conversation with him. It was one conversation with some combination of those four people throughout the conversation. And that conversation was 15 minutes, maybe 20. Again, that is a guess.” Sherman Dep., P. 205-206.
 - 37. See BA00133435-6 and BA00123692-696.

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED] 39

- I am unaware of any documents or deposition testimony that supports Mr. Sherman's speculation that the Avios cost of award tickets would have increased absent the YQ Charge.⁴⁰
- I note, too, that BA did not increase the Avios cost of short-haul award tickets when it removed the YQ Charge on such tickets in December 2014.⁴¹

24. Similarly, the [REDACTED]

[REDACTED]
[REDACTED]
[REDACTED] These documents, [REDACTED]

38. See BA00123694.

39. BA00123694.

40. I understand that Mr. Kokonis is also unaware of such documents or testimony. See Supplemental Report of Robert Kokonis (hereafter "Kokonis Supplemental Report"), ¶21.

41. I explained in my July 15, 2015 Reply Report that the fuel prices were substantially higher in December 2014 compared to BA's assumed benchmark of 2003/2004. Therefore, the elimination of short haul YQ Charges were not caused by fuel prices falling below BA's assumed benchmark. See Arnold Reply Report, ¶30.

42. Sherman Supplemental Report, ¶119.

[REDACTED]
[REDACTED]
[REDACTED] I am unaware of any documents or deposition testimony that supports Mr. Sherman's speculation that "a similar charge" would have been imposed absent the YQ Charge.⁴³

25. BA also maintained the same Avios costs for award tickets during the class period even when its YQ Charges varied from the "global" YQ Charge it imposed, indicating that it did not recognize the YQ Charge-Avios tradeoff that Mr. Sherman speculates would have been implemented (or, more precisely, the tradeoff that he "understands" would have existed). For example:

- As described by Mr. Kokonis, BA made many "tactical" adjustments to its YQ Charge throughout the proposed class period.⁴⁴ I have seen no documents or fact testimony to the effect that BA adjusted its Avios program in response to these tactical YQ changes. Mr. Sherman's logic implies that BA would have made such Avios adjustment.
- BA's YQ Charge often varied on the same route depending on the point of sale, including substantial differences between UK-

43. I understand that Mr. Kokonis is also unaware of such documents or testimony. See Kokonis Supplemental Report, ¶21. Mr. Kokonis also informs me that, in his experience within the airline industry, it is very likely that, had BA truly been considering a major change to its Avios program or assessing some alternative fee to replace the YQ Charges, BA would have significant, contemporaneous documentation demonstrating that it was considering such a policy change.

44. Expert Report of Robert Kokonis, May 4, 2015, ¶¶18-19 and Appendix D.

originating and US-originating YQ Charges on the same route.⁴⁵

Following Mr. Sherman's logic that there is substitution between cash (YQ Charge) and Avios paid for a redemption ticket, one would expect to see point-of-sale differences in the amount of Avios required to purchase a ticket on a given route. I have seen nothing in the record showing that BA implemented such a policy.

B. AIRLINES' FREQUENT FLYER PROGRAMS ARE SUBJECT TO COMPETITIVE FORCES, FURTHER DEMONSTRATING THAT MR. SHERMAN'S HYPOTHESIS IS INCORRECT.

26. Mr. Sherman's hypothesis that BA can unilaterally change the value of Avios, without further consequence, in a scenario without YQ Charges completely ignores the fact that the value of Avios is subject to competitive forces that are independent from fees and charges. The fact that such forces exist is demonstrated by several forms of market conduct.

27. First, frequent flyer miles issued by different airlines are highly substitutable. For example, BA's Avios can be used to purchase tickets on other airlines, specifically members of the *Oneworld* alliance, such as American Airlines.⁴⁶ Conversely, frequent flyer miles issued by other airlines can be redeemed with BA.⁴⁷ The implication is that BA cannot unilaterally change the

45. Arnold Report, Figure 8.

46. See BA website <http://www.britishairways.com/en-us/executive-club/spending-avios>.

47. See AA website <https://www.aa.com/i18n/AAdvantage/redeemMiles/main.jsp>.

value of Avios because consumers can easily substitute where they earn and where they spend their frequent flyer miles.

28. Second, frequent flyer programs have dramatically expanded since their introduction in the early 1980s.⁴⁸ Today, frequent flyer miles can be both earned and redeemed on hotel stays, car rentals, and regular purchases.⁴⁹ The value of such products and services, and thus the value of frequent flyer miles required to pay for them, are unaffected by the level of BA YQ Charge.

29. Robert Kokonis, an industry expert, has informed me that industry practice indicates that major airlines generally adopt similar terms of their frequent flyer programs with regard to both policies governing earnings and redemptions.⁵⁰ For example, I note that most airlines during the class period

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48. “On 1 May, 1981, American Airlines launched the world’s first mileage-based frequent flier program, AAdvantage. Initial rewards for frequent fliers included First Class upgrades from Economy for 12,000 miles, and 20% off a roundtrip ticket for 20,000 miles. Within a few days, United Airlines followed with its own loyalty program, Mileage Plus. The air miles war had started. Today, there are over 130 airline mileage FFP (Frequent Flyer Programs) worldwide, and a complex web of airline alliances and partnerships. AAdvantage now boasts 25 participating airlines and 1,500 overall program participants. Today, step out of your home, and you’re collecting frequent flier miles for the most mundane chores, like filling petrol or buying groceries.” Airlines: Hidden Value of Airline Loyalty Programs, Morgan Stanley, July 31, 2007, P. 7.
49. The only publicly listed frequent flyer program in mid-2007, Air Canada’s spin-off, Aeroplan, reported that only 28% of its gross billings (which correspond to miles earned by members) came from Air Canada or its affiliates, with the bulk of billings coming from credit card companies. See Airlines: Hidden Value of Airline Loyalty Programs, Morgan Stanley, July 31, 2007, P. 5-6.
50. See Kokonis Supplemental Report, ¶21.

followed an industry standard for a non-peak domestic round-trip redemption tickets during the class period of 25,000.⁵¹

30. Importantly, airlines assess the same “charge” in frequent flier miles even though they assess different fuel surcharge. For example, as noted in my original report, neither Delta nor Northwest Airlines assessed a fuel surcharge during the class period, save for a very short period of time.⁵²

IV. MR. SHERMAN’S CLAIM THAT THE Y FARE IS COMMONLY USED, AND HENCE RELEVANT TO AWARD TICKETS, IS BASELESS.

31. In my Reply Report, I demonstrated that many of Mr. Sherman’s responses to my analysis were misleading because he compared the YQ Charges to the price of a Y class fare, that is, a full price, undiscounted ticket.⁵³ The primary basis for my view that the Y fare is not a relevant comparison for redemption tickets is that the Y fare reflects neither the opportunity cost of a reward ticket from BA’s perspective, nor the next best substitute for a reward ticket from the consumer’s perspective. My economic analysis was supported by Plaintiffs’ industry expert, Mr. Kokonis, who explained that the Y-fare was not used frequently.

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51. “Flier-mile plans take a turn; Survey finds mixed feelings on loyalty programs”, USA Today, February 10, 2014. Note that this redemption cost stayed relatively stable, see “Frequent Flyer Programs: Valued as Hidden Assets”, Salomon Smith Barney, November 28, 2000, describes the “industry standard for a non-peak domestic award is 25,000 miles”, P. 4.
 52. Arnold Report, ¶16. See also Arnold Report, footnote 47.
 53. Arnold Reply Report, ¶¶24-25.

32. Mr. Sherman now presents new data from BA that “demonstrates that BA sold approximately [REDACTED] in each of [2011 and 2012].”⁵⁴ While this misses my main point (i.e., that the Y-fare does not reflect either BA’s opportunity cost or the next best substitute for reward tickets), Mr. Sherman’s data *confirms* that Mr. Kokonis was correct to explain to me that the Y fare is in fact rarely paid by travelers in practice.⁵⁵ The data produced by Mr. Sherman demonstrate that only [REDACTED], both in 2011 and 2012. Similarly, only [REDACTED] . See Figure 3.

Figure 3

Sherman's Y - Fare Analysis

Year	Booking Class	Tickets	Tickets as a Percent of		PSJs as a Percent of	
			Total	PSJs	Total	PSJs
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: Sherman-00002751

33. Mr. Sherman further argues that use of the Y fare as a comparison for award tickets is appropriate because “class members regularly took advantage

54. Sherman Supplemental Report, ¶114.

55. While it does not impact my conclusions, I note that Mr. Sherman’s metric of “segments” is economically irrelevant because customers purchase (and BA sells) tickets, not segments.

of full fare benefits to modify their itineraries and request full refunds and exchanges, characteristics that support using as the proper comparison, if one is to be made at all, fully refundable fare classes (e.g., a Y fare)".⁵⁶ This is an irrelevant argument. The fact that class members might take advantage of a benefit that accompanies reward tickets (in this case their refundability) does not mean that they would *pay* to secure those benefits. Instead, the likely next best substitute for the "free" award ticket is not the *highest* priced fare but the *lowest* priced available fare.

V. MR. KASPER MAKES SEVERAL CLAIMS THAT ARE INCORRECT OR ECONOMICALLY IRRELEVANT.

34. While Mr. Kasper largely does not comment on my analyses in his Supplemental Report, counsel has asked me to offer my economic opinion regarding several of his claims. I find each of the claims addressed in this section either incorrect or economically irrelevant.

35. Mr. Kasper criticizes Mr. Kokonis for claiming that BA "set the fuel surcharge at the highest possible price the market would bear."⁵⁷ This is an unusual criticism for Mr. Kasper to express, since, as I noted in my reply report, he himself has opined that the YQ Charge is simply an element of the all in price that BA is setting to maximize its profits.⁵⁸ Any profit maximizing firm sets its prices at the highest point that market conditions (including supply and demand factors, as

56. Sherman Supplemental Report, ¶115.

57. Kasper Supplemental Report, ¶146.

58. See Arnold Reply Report, ¶¶14-17.

well as the expected responses of its competitors) will permit. Indeed when Mr. Kasper notes that BA's YQ Charge was "often limited by competitors' pricing behavior,"⁵⁹ he is in fact offering support for Mr. Kokonis' claim.

36. Mr. Kasper offers several critiques of Mr. Kokonis' claims regarding the profitability of airline industry generally and BA in particular. He implies that BA's supposed decline in "real yields" between 2001 and 2013 indicate that "BA's inability to collect [REDACTED]"⁶⁰ would have resulted in financial hardship for BA. While, as I discuss in more detail below, Mr. Kasper's use of real figures is inappropriate, it is also notable that the amount of YQ Charge revenue at issue in this litigation is modest in comparison to BA's overall revenues and profitability during the class period. As shown below in Figure 4, [REDACTED]

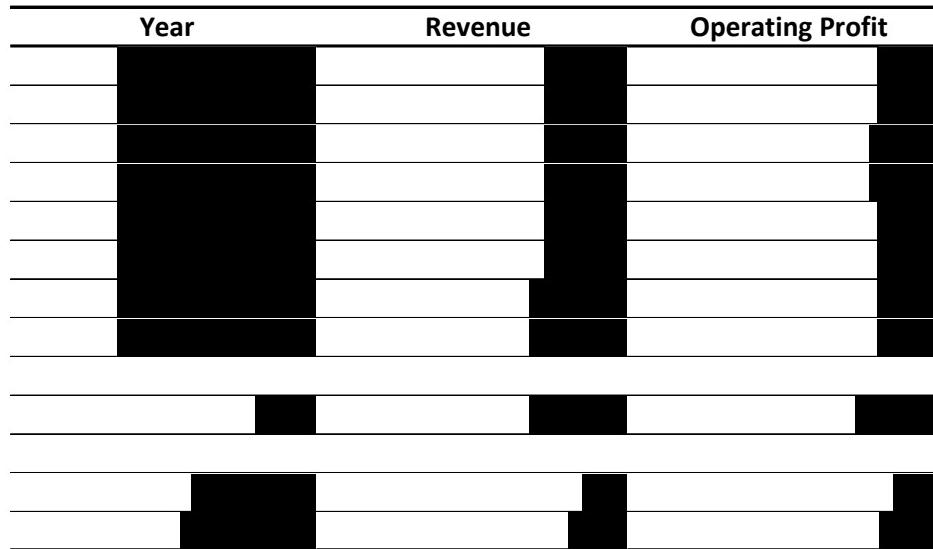
[REDACTED]
[REDACTED]
[REDACTED] That is, BA's financial position does not appear to have been materially affected by the YQ Charges it improperly collected from class members.

59. Kasper Supplemental Report, ¶146.

60. Kasper Supplemental Report, ¶151.

Figure 4

**British Airways Revenue & Operating Profit
Relative to YQ Charges Paid by Class Members**



Source: BA Annual Reports; 2010Q4 BA Quarterly Report; ICW data received on 04 03 2015 (BA00174616-BA00174621); ICW data received on 04 15 2015 (BA00174625-BA00174626).

37. Mr. Kasper argues at length that the airline industry was experiencing financial difficulties during the class period.⁶¹ He states that the “putative class period was a uniquely challenging period for the aviation industry.”⁶² While I do not endorse Mr. Kasper’s characterization of the airline industry’s financial health (in particular, he has not presented data demonstrating that it was “uniquely challenging”), it is irrelevant to the question of whether the YQ Charge was in fact a fuel surcharge (or whether BA’s imposition of this charge breached its contract with the class members).

61. Kasper Supplemental Report, ¶¶153-155.

62. Kasper Supplemental Report, ¶154.

38. Mr. Kasper also argues that “Mr. Kokonis fails to acknowledge that the alternative fuel surcharge schemes that he and Dr. Arnold favor would require BA to completely overhaul its fuel surcharge system, at considerable additional cost to BA.”⁶³ This is a classic example of faulty retrospective (*ex post*) logic rather than appropriate forward looking (*ex ante*) reasoning.⁶⁴ If BA had in 2004 adopted an actual fuel surcharge instead of the YQ Charge, there would be no cost associated with “overhauling” its systems—the cost it incurred to implement the YQ Charge would be a cost to implement an actual fuel surcharge.

39. Mr. Kasper presents charts on pages 53 and 54 of his Supplemental Report that express global airlines’ and BA’s revenue figures in real terms, deflated by the US All-Items Consumer Price Index (CPI), in an attempt to measure global airlines’ and BA’s financial performance during the class period.

- Mr. Kasper does not explain why a measure of US inflation is the relevant metric to apply to global airlines’ revenue in his chart on page 53. Even more baffling is Mr. Kasper’s application of the US CPI to BA passenger yields measured in British Pounds in his chart on

63. Kasper Supplemental Report, ¶152.

64. Mr. Kasper’s and Mr. Sherman’s discussions of BA’s existing long-term corporate contracts suffer from the same logical mistake. It is not relevant if it would have been difficult to change some contracts in 2006—what matters within the context of this litigation is how those contracts would have been drafted in the first instance had BA adhered to the terms of its contract with Executive Club members. I observe that at least two of BA’s competitors—Northwest and Delta Airlines—were able to enter into contracts that did not rely on the long-term imposition of YQ Charges, and I have seen no evidence to indicate that BA could not have done this as well.

page 54, since it is unreliable and incorrect to apply one country's inflation rate to revenues denominated in another country's currency.

- More fundamentally, businesses, such as BA, make decisions based on their actual (nominal) revenues and profits. For example, BA explicitly compares actual (nominal) yields for different years by including them in the same table next to each other in its annual reports. Mr. Kasper apparently thinks that the comparison BA is demonstrating to its investors is inappropriate. Instead he takes the yield data from BA annual reports and converts them into what he terms real yields (using the US CPI). Mr. Kasper does not explain how his methodology could be valid.

40. Mr. Kasper criticizes Mr. Kokonis' "reliance on RPK" as a "proxy for demand" because "airlines are often forced to lower fares during periods of weak demand in order to fill seats that otherwise would have gone empty."⁶⁵ Instead, Mr. Kasper proposes using operating revenues per ASK, a price measure. Mr. Kasper is not correct to use a price measure as a "proxy for demand," however, because price levels reflect equilibrium between supply and demand and do not, alone, provide sufficient information about demand. This is so because supply-side effects, such as entry and expansion of low-cost carriers can drive the prices

65. Kasper Supplemental Report, ¶150.

down, even with increased demand. In other words, “operating revenues per ASK” is not a reliable method for determining demand.

VI. CONCLUSION

41. In my initial expert report and my reply report in this matter, I reached a number of conclusions, including that YQ Charges are not reasonably related to fuel prices or BA’s fuel costs. I also concluded that, from an economic perspective, using 2003 as a reference period for computing the YQ Charge year after year is both arbitrary and inappropriate. As explained above, nothing in the reports BA’s experts proffered over the past two-and-a-half weeks undermines my conclusions.

September 14, 2015



Jonathan I. Arnold, Ph. D.

APPENDIX 1

Materials Relied Upon

Depositions:

Deposition and Exhibits of Marc Sherman, August 21, 2015

Expert Reports:

Expert Report of Jonathan I. Arnold, Ph.D., May 4, 2015

Expert Reply Report of Jonathan I. Arnold, Ph.D., July 15, 2015

Rebuttal Report of Andrew K.G. Hildreth, Ph.D, August 28, 2015

Corrected Industry Expert Report of Daniel M. Kasper, Supplemented, September 4, 2015

Expert Report of Robert Kokonis, May 4, 2015

Supplemental Report of Robert Kokonis, September 14, 2015

Corrected Rebuttal Report of Marc B. Sherman, Supplemented, August 28, 2015

Produced Data:

Data relied upon by Andrew K.G. Hildreth for his expert report

Data relied upon by Marc B. Sherman for his expert report

Bates Numbered Documents:

BA00088730-732

BA00123692-696

BA00133435-6

BA00174228

British Airways Data Sources:

ICW data received on April 3, 2015 (BA00174616-BA00174621)

ICW data received on April 15, 2015 (BA00174625, BA00174626)

Articles & Books:

"Airlines: Hidden Value of Airline Loyalty Programs", Morgan Stanley, July 31, 2007.

Chris Brooks, Introductory Econometrics for Finance, (2002).

"Flier-mile plans take a turn: Survey finds mixed feelings on loyalty programs", USA Today, February 10, 2014.

"Frequent Flyer Programs: Valued as Hidden Assets", Salomon Smith Barney, November 28, 2000.

Peter Kennedy, A Guide to Econometrics, 5th Edition (2003).

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Damodar N. Gujarati, Basic Econometrics, 3rd Edition (1995).

Gujarati, D.N. and Porter, D.C., Essentials of Econometrics, 4th Ed., McGraw-Hill, 2010.

Jeffrey M. Wooldridge, Introductory Econometrics: A Modern Approach, 2nd Edition (2003).

Public Data Sources:

British Airlines Annual Reports, available at:

<http://www.iairgroup.com/phoenix.zhtml?c=240949&p=irol-reportsannual>

2006/2007 Annual Report & Accounts

2007/08 Annual Report and Accounts

2008/09 Annual Report and Accounts

2009/10 Annual Report and Accounts

Annual Report and Accounts Year ended 31 December 2011

Annual Report and Accounts Year ended 31 December 2012

Annual Report and Accounts Year ended 31 December 2013

British Airlines Quarterly Reports, available at:

<http://www.iairgroup.com/phoenix.zhtml?c=240949&p=irol-reportsother>

British Airways Results Announcement, Nine month period April 1, 2010 – December 31, 2010

Federal Reserve Exchange Rates, H-10 data release, downloaded March 9, 2015, available at:

<http://www.federalreserve.gov/releases/h10/Hist/>

Public Sources:

AA Website: <https://www.aa.com/i18n/AAdvantage/redeemMiles/main.jsp>.

BA Website: <http://www.britishairways.com/en-us/executive-club/spending-avios>.

https://en.wikipedia.org/wiki/Correlation_does_not_imply_causation.

APPENDIX 2

**Appendix 2 - Augmented Dickey Fuller Test
Levels**

		Statistical Significance	
	Test Statistic (Tau)	(p-Value)	Test Result
Arnold Data (Figure 1 Arnold Reply Report)			
Jet Fuel	-1.285	0.640	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller	-0.606	0.867	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller Plus	-0.573	0.874	Non-Stationary / Cannot Correlate
Long haul < 9 Hrs Club World & First	0.027	0.960	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller	-0.920	0.782	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller Plus	-0.735	0.836	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs Club World & First	-0.333	0.918	Non-Stationary / Cannot Correlate
Sherman's Data (Chart 4/Figure 2 Arnold Rebuttal Report)			
Weighted Spot Price of Jet Fuel	-1.455	0.557	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller	-0.227	0.933	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller Plus	-0.218	0.934	Non-Stationary / Cannot Correlate
Long haul < 9 Hrs Club World & First	0.313	0.979	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller	-0.579	0.873	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller Plus	-0.439	0.900	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs Club World & First	-0.025	0.955	Non-Stationary / Cannot Correlate
Short Haul Euro Traveller	-1.767	0.397	Non-Stationary / Cannot Correlate
Short Haul Club Europe	-1.396	0.586	Non-Stationary / Cannot Correlate
Hildreth's Data (Ammended Complaint)			
<i>Replication of Plaintiff's Ammended Complaint</i>			
Jet kerosene NY Barge Spot	-1.454	0.557	Non-Stationary / Cannot Correlate
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-1.302	0.631	Non-Stationary / Cannot Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-1.297	0.634	Non-Stationary / Cannot Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-1.760	0.401	Non-Stationary / Cannot Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-1.646	0.459	Non-Stationary / Cannot Correlate
<i>Replication with daily \$ rate</i>			
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-1.308	0.628	Non-Stationary / Cannot Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-1.393	0.588	Non-Stationary / Cannot Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-1.696	0.433	Non-Stationary / Cannot Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-1.748	0.406	Non-Stationary / Cannot Correlate

Notes: The null hypothesis is that the series are non-stationary (have unit root). p-Values above the typically used 0.05 (5% level) indicate that the null hypothesis that the data are non-stationary cannot be rejected. The single mean, zero lags test results are reported.

Source: BA00174228, BA00088730-732; Sherman_00002554; Hildreth_00000001; Federal Reserve Foreign Exchange Rates - H.10 Release as of March 9, 2015.

APPENDIX 3

**Appendix 3 - Phillips-Perron Test
Levels**

		Statistical Significance	
	Test Statistic (Tau)	(p-Value)	Test Result
Arnold Data (Figure 1 Arnold Reply Report)			
Jet Fuel	-1.285	0.640	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller	-0.606	0.867	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller Plus	-0.573	0.874	Non-Stationary / Cannot Correlate
Long haul < 9 Hrs Club World & First	0.027	0.960	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller	-0.920	0.782	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller Plus	-0.735	0.836	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs Club World & First	-0.333	0.918	Non-Stationary / Cannot Correlate
Sherman's Data (Chart 4/Figure 2 Arnold Rebuttal Report)			
Weighted Spot Price of Jet Fuel	-1.455	0.557	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller	-0.227	0.933	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller Plus	-0.218	0.934	Non-Stationary / Cannot Correlate
Long haul < 9 Hrs Club World & First	0.313	0.979	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller	-0.579	0.873	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller Plus	-0.439	0.900	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs Club World & First	-0.025	0.955	Non-Stationary / Cannot Correlate
Short Haul Euro Traveller	-1.767	0.397	Non-Stationary / Cannot Correlate
Short Haul Club Europe	-1.396	0.586	Non-Stationary / Cannot Correlate
Hildreth's Data (Ammended Complaint)			
<i>Replication of Plaintiff's Ammended Complaint</i>			
Jet kerosene NY Barge Spot	-1.360	0.604	Non-Stationary / Cannot Correlate
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-1.302	0.631	Non-Stationary / Cannot Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-1.297	0.634	Non-Stationary / Cannot Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-1.760	0.401	Non-Stationary / Cannot Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-1.646	0.459	Non-Stationary / Cannot Correlate
<i>Replication with daily \$ rate</i>			
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-1.308	0.628	Non-Stationary / Cannot Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-1.393	0.588	Non-Stationary / Cannot Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-1.696	0.433	Non-Stationary / Cannot Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-1.748	0.406	Non-Stationary / Cannot Correlate

Notes: The null hypothesis is that the series are non-stationary (have unit root). p-Values above the typically used 0.05 (5% level) indicate that the null hypothesis that the data are non-stationary cannot be rejected. The single mean, zero lags test results are reported.

Source: BA00174228, BA00088730-732; Sherman_00002554; Hildreth_00000001; Federal Reserve Foreign Exchange Rates - H.10 Release as of March 9, 2015.

**Appendix 3 - Kwiatkowski-Phillips-Schmidt-Shin Test
Levels**

	Statistical Significance		
	Test Statistic (Eta)	(p-Value)	Test Result
Arnold Data (Figure 1 Arnold Reply Report)			
Jet Fuel	7.849	0.000	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller	9.472	0.000	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller Plus	8.750	0.000	Non-Stationary / Cannot Correlate
Long haul < 9 Hrs Club World & First	9.078	0.000	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller	9.350	0.000	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller Plus	8.895	0.000	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs Club World & First	9.066	0.000	Non-Stationary / Cannot Correlate
Sherman's Data (Chart 4/Figure 2 Arnold Rebuttal Report)			
Weighted Spot Price of Jet Fuel	9.404	0.000	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller	10.806	0.000	Non-Stationary / Cannot Correlate
Long Haul < 9 Hrs World Traveller Plus	11.175	0.000	Non-Stationary / Cannot Correlate
Long haul < 9 Hrs Club World & First	11.194	0.000	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller	10.765	0.000	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs World Traveller Plus	11.304	0.000	Non-Stationary / Cannot Correlate
Long Haul > 9 Hrs Club World & First	11.309	0.000	Non-Stationary / Cannot Correlate
Short Haul Euro Traveller	9.724	0.000	Non-Stationary / Cannot Correlate
Short Haul Club Europe	10.459	0.000	Non-Stationary / Cannot Correlate
Hildreth's Data (Ammended Complaint)			
<i>Replication of Plaintiff's Ammended Complaint</i>			
Jet kerosene NY Barge Spot	0.964	0.003	Non-Stationary / Cannot Correlate
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	2.837	0.000	Non-Stationary / Cannot Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	3.973	0.000	Non-Stationary / Cannot Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	1.868	0.000	Non-Stationary / Cannot Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	3.335	0.000	Non-Stationary / Cannot Correlate
<i>Replication with daily \$ rate</i>			
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	1.392	0.000	Non-Stationary / Cannot Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	3.036	0.000	Non-Stationary / Cannot Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	0.742	0.010	Non-Stationary / Cannot Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	2.284	0.000	Non-Stationary / Cannot Correlate

Notes: The null hypothesis is that the series are stationary. P-Values below the typically used 0.05 (5% level) indicate that the null hypothesis that the data are stationary can be rejected. The single mean test results are reported.

Source: BA00174228, BA00088730-732; Sherman_00002554; Hildreth_00000001; Federal Reserve Foreign Exchange Rates - H.10 Release as of March 9, 2015.

APPENDIX 4

**Appendix 4 - Augmented Dickey Fuller Test
First Differences**

	Test Statistic (Tau)	Statistical Significance		Test Result
		(p-Value)		
Arnold Data (Figure 1 Arnold Reply Report)				
Jet Fuel	-50.906	0.000	Stationary / Can Correlate	
Long Haul < 9 Hrs World Traveller	-56.952	0.000	Stationary / Can Correlate	
Long Haul < 9 Hrs World Traveller Plus	-53.512	0.000	Stationary / Can Correlate	
Long haul < 9 Hrs Club World & First	-53.535	0.000	Stationary / Can Correlate	
Long Haul > 9 Hrs World Traveller	-56.907	0.000	Stationary / Can Correlate	
Long Haul > 9 Hrs World Traveller Plus	-53.486	0.000	Stationary / Can Correlate	
Long Haul > 9 Hrs Club World & First	-53.498	0.000	Stationary / Can Correlate	
Sherman's Data (Chart 4/Figure 2 Arnold Rebuttal Report)				
Weighted Spot Price of Jet Fuel	-53.863	0.000	Stationary / Can Correlate	
Long Haul < 9 Hrs World Traveller	-60.416	0.000	Stationary / Can Correlate	
Long Haul < 9 Hrs World Traveller Plus	-60.424	0.000	Stationary / Can Correlate	
Long haul < 9 Hrs Club World & First	-60.443	0.000	Stationary / Can Correlate	
Long Haul > 9 Hrs World Traveller	-60.372	0.000	Stationary / Can Correlate	
Long Haul > 9 Hrs World Traveller Plus	-60.396	0.000	Stationary / Can Correlate	
Long Haul > 9 Hrs Club World & First	-60.410	0.000	Stationary / Can Correlate	
Short Haul Euro Traveller	-60.355	0.000	Stationary / Can Correlate	
Short Haul Club Europe	-60.360	0.000	Stationary / Can Correlate	
Hildreth's Data (Amended Complaint)				
<i>Replication of Plaintiff's Amended Complaint</i>				
Jet kerosene NY Barge Spot	-35.356	0.000	Stationary / Can Correlate	
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-35.955	0.000	Stationary / Can Correlate	
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-35.975	0.000	Stationary / Can Correlate	
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-35.924	0.000	Stationary / Can Correlate	
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-35.947	0.000	Stationary / Can Correlate	
<i>Replication with daily \$ rate</i>				
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-36.762	0.000	Stationary / Can Correlate	
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-36.435	0.000	Stationary / Can Correlate	
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-36.552	0.000	Stationary / Can Correlate	
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-36.192	0.000	Stationary / Can Correlate	

Notes: The null hypothesis is that the series are non-stationary (have unit root). p-Values below the typically used 0.05 (5% level) indicate that the null hypothesis that the data are non-stationary can be rejected. The single mean, zero lags test results are reported.

Source: BA00174228, BA00088730-732; Sherman_00002554; Hildreth_00000001; Federal Reserve Foreign Exchange Rates - H.10 Release as of March 9, 2015.

**Appendix 4 - Phillips-Perron Test
First Differences**

	Statistical Significance		
	Test Statistic (Tau)	(p-Value)	Test Result
Arnold Data (Figure 1 Arnold Reply Report)			
Jet Fuel	-50.906	0.000	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller	-56.952	0.000	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller Plus	-53.512	0.000	Stationary / Can Correlate
Long haul < 9 Hrs Club World & First	-53.535	0.000	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller	-56.907	0.000	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller Plus	-53.486	0.000	Stationary / Can Correlate
Long Haul > 9 Hrs Club World & First	-53.498	0.000	Stationary / Can Correlate
Sherman's Data (Chart 4/Figure 2 Arnold Rebuttal Report)			
Weighted Spot Price of Jet Fuel	-53.863	0.000	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller	-60.416	0.000	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller Plus	-60.424	0.000	Stationary / Can Correlate
Long haul < 9 Hrs Club World & First	-60.443	0.000	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller	-60.372	0.000	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller Plus	-60.396	0.000	Stationary / Can Correlate
Long Haul > 9 Hrs Club World & First	-60.410	0.000	Stationary / Can Correlate
Short Haul Euro Traveller	-60.355	0.000	Stationary / Can Correlate
Short Haul Club Europe	-60.360	0.000	Stationary / Can Correlate
Hildreth's Data (Amended Complaint)			
<i>Replication of Plaintiff's Amended Complaint</i>			
Jet kerosene NY Barge Spot	-35.685	0.000	Stationary / Can Correlate
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-35.955	0.000	Stationary / Can Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-35.975	0.000	Stationary / Can Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-35.924	0.000	Stationary / Can Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-35.947	0.000	Stationary / Can Correlate
<i>Replication with daily \$ rate</i>			
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	-36.762	0.000	Stationary / Can Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	-36.435	0.000	Stationary / Can Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	-36.552	0.000	Stationary / Can Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	-36.192	0.000	Stationary / Can Correlate

Notes: The null hypothesis is that the series are non-stationary (have unit root). p-Values below the typically used 0.05 (5% level) indicate that the null hypothesis that the data are non-stationary can be rejected. The single mean, zero lags test results are reported.

Source: BA00174228, BA00088730-732; Sherman_00002554; Hildreth_00000001; Federal Reserve Foreign Exchange Rates - H.10 Release as of March 9, 2015.

**Appendix 4 - Kwiatkowski-Phillips-Schmidt-Shin Test
First Differences**

	Statistical Significance		
	Test Statistic (Eta)	(p-Value)	Test Result
Arnold Data (Figure 1 Arnold Reply Report)			
Jet Fuel	0.045	0.907	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller	0.081	0.689	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller Plus	0.077	0.713	Stationary / Can Correlate
Long haul < 9 Hrs Club World & First	0.107	0.554	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller	0.063	0.795	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller Plus	0.068	0.764	Stationary / Can Correlate
Long Haul > 9 Hrs Club World & First	0.076	0.718	Stationary / Can Correlate
Sherman's Data (Chart 4/Figure 2 Arnold Rebuttal Report)			
Weighted Spot Price of Jet Fuel	0.057	0.836	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller	0.082	0.679	Stationary / Can Correlate
Long Haul < 9 Hrs World Traveller Plus	0.071	0.744	Stationary / Can Correlate
Long haul < 9 Hrs Club World & First	0.143	0.411	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller	0.059	0.822	Stationary / Can Correlate
Long Haul > 9 Hrs World Traveller Plus	0.063	0.796	Stationary / Can Correlate
Long Haul > 9 Hrs Club World & First	0.094	0.615	Stationary / Can Correlate
Short Haul Euro Traveller	0.174	0.325	Stationary / Can Correlate
Short Haul Club Europe	0.104	0.568	Stationary / Can Correlate
Hildreth's Data (Amended Complaint)			
<i>Replication of Plaintiff's Amended Complaint</i>			
Jet kerosene NY Barge Spot	0.086	0.656	Stationary / Can Correlate
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	0.132	0.450	Stationary / Can Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	0.098	0.596	Stationary / Can Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	0.125	0.477	Stationary / Can Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	0.111	0.533	Stationary / Can Correlate
<i>Replication with daily \$ rate</i>			
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	0.127	0.470	Stationary / Can Correlate
Ihr-jfk-first/Jet Kerosene NY Barge Spot	0.087	0.655	Stationary / Can Correlate
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	0.114	0.521	Stationary / Can Correlate
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	0.091	0.632	Stationary / Can Correlate

Notes: The null hypothesis is that the series are stationary. P-Values above the typically used 0.05 (5% level) indicate that the null hypothesis that the data are stationary cannot be rejected. The single mean test results are reported.

Source: BA00174228, BA00088730-732; Sherman_00002554; Hildreth_00000001; Federal Reserve Foreign Exchange Rates - H.10 Release as of March 9, 2015.

APPENDIX 5

**Appendix 5 - R-Squared and Correlation Coefficients by Data Source
First Differences**

	R-Squared	Correlation Coefficient	Spearman Correlation Coefficient
Arnold Data (Figure 1 Arnold Reply Report)			
Long Haul < 9 Hrs World Traveller	0.000	0.012	0.017
Long Haul < 9 Hrs World Traveller Plus	0.000	-0.003	0.012
Long haul < 9 Hrs Club World & First	0.000	-0.005	0.004
Long Haul > 9 Hrs World Traveller	0.000	-0.001	0.012
Long Haul > 9 Hrs World Traveller Plus	0.000	-0.014	0.006
Long Haul > 9 Hrs Club World & First	0.000	-0.016	-0.002
Sherman's Data (Chart 4/Figure 2 Arnold Rebuttal Report)			
Long Haul < 9 Hrs World Traveller	0.000	0.013	0.009
Long Haul < 9 Hrs World Traveller Plus	0.000	-0.002	0.003
Long haul < 9 Hrs Club World & First	0.000	-0.003	-0.003
Long Haul > 9 Hrs World Traveller	0.000	0.000	0.004
Long Haul > 9 Hrs World Traveller Plus	0.000	-0.012	-0.002
Long Haul > 9 Hrs Club World & First	0.000	-0.014	-0.009
Short Haul Euro Traveller	0.001	-0.025	-0.033
Short Haul Club Europe	0.001	-0.033	-0.039
Hildreth's Data (Amended Complaint)			
<i>Replication of Plaintiff's Amended Complaint</i>			
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	0.000	0.018	0.034
Ihr-jfk-first/Jet Kerosene NY Barge Spot	0.000	-0.006	0.023
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	0.000	-0.001	0.025
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	0.000	-0.011	0.012
<i>Replication with daily \$ rate</i>			
Ihr-jfk-econ/Jet Kerosene NY Barge Spot	0.015	0.122	0.235
Ihr-jfk-first/Jet Kerosene NY Barge Spot	0.008	0.089	0.236
Ihr-sfo-econ/Jet Kero San Francisco CA Pipeline	0.010	0.098	0.251
Ihr-lax-first/Jet Kero Los Angeles CA Pipeline	0.007	0.086	0.253

Source: BA00174228, BA00088730-732; Sherman_00002554; Hildreth_00000001; Federal Reserve Foreign Exchange Rates - H.10

Release as of March 9, 2015.